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**G4D DDF D401 D411 D423**  
**H4R RTR**

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(58) Field of search  
 UK CL (Edition J) **G4A AUX, G4D DDF, G4H HTD,**  
**G4M MAA**  
 INT CL<sup>a</sup> **G06F, G06K**

(54) **Meter reading device**

(57) A utility meter incorporates means to provide information identifying the meter, 1, and information indicative of the meter reading. A device to be utilised in reading the meter comprises a memory 8 and means to transfer, to the memory, the information provided by the meter. The memory is provided with means to enable information to be transferred directly to a computer. The information may be passed from the meter to the device by radio, ultrasonic, or optical transmission.

An electricity meter has a modem 15 connected with a transmitter 2 and a receiver 3 and with a ring main supplied through the meter. The meter reading device 5 has a modem 16 connected through a plug and socket 18, 19 with the ring main for transmitting and receiving signals between the meter and meter reading device. A suppressor 13 prevents data signals passing back through the mains supply.

Data are downloaded to a computer from an output port 11 of the device memory.

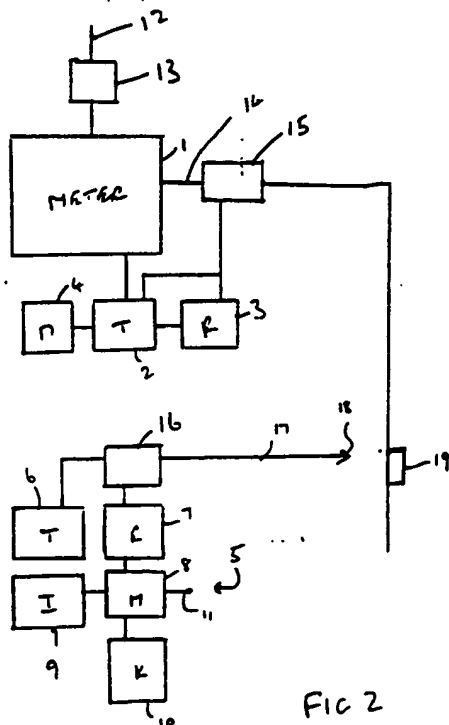


FIG 2

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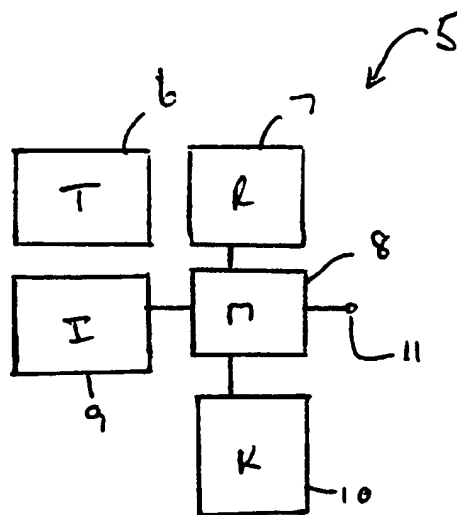
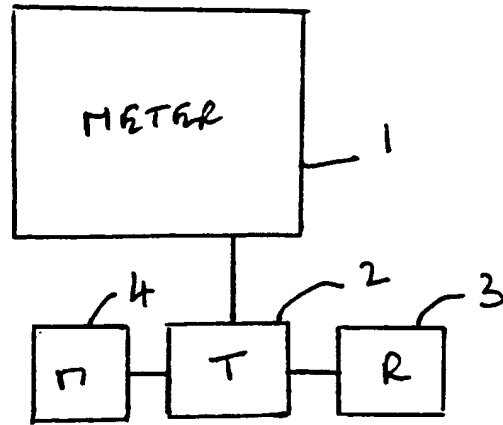


FIG 1

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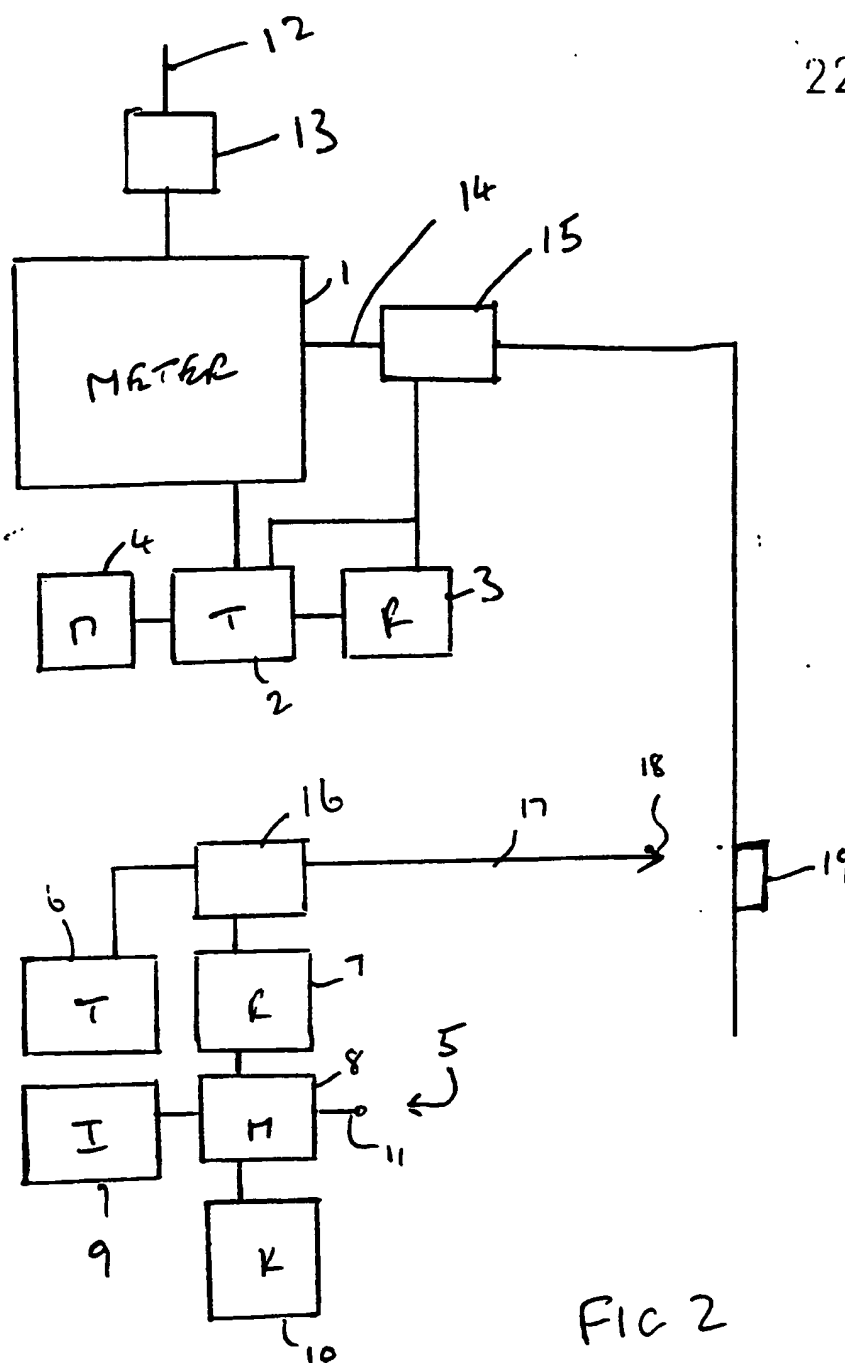


FIG 2

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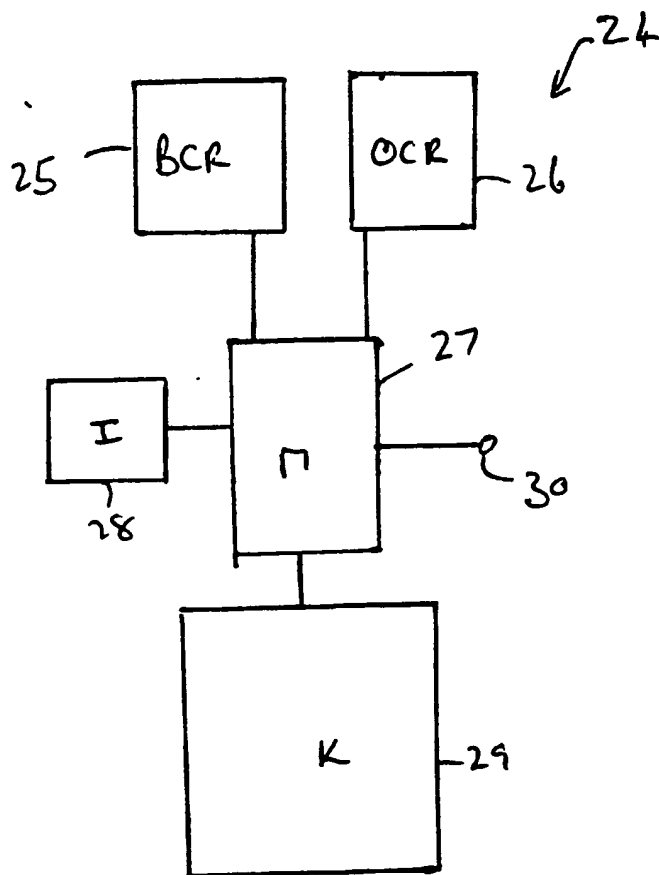
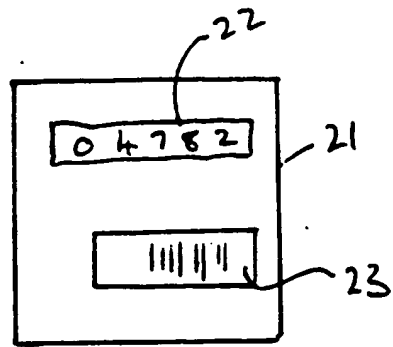


FIG 3

-1-

## Description of the Invention

5       Improvements in or relating to apparatus for reading a  
meter

10       THE PRESENT INVENTION relates to apparatus for reading a  
meter, and more particularly relates to apparatus for  
reading a utility meter such as a gas meter, electricity  
meter or water meter.

15       At the present point in time virtually all  
homes, shops, offices and other premises are provided  
with an electricity meter, and a large proportion of  
such premises are provided with a gas meter. Some prem-  
ises are additionally provided with a water meter.

20       From time-to-time the reading present on the  
meter must be taken. At the present point in time a  
meter reader attends the premises in question and writes  
down the meter reading on a card or in an appropriate  
book. Subsequently the reading entered on the card or  
25       in the book is, in most cases, entered on to a computer,  
thus enabling the bill for the electricity, gas or water  
supplied since the last meter reading to be prepared and  
sent to the person responsible for the premises in  
question.

30       There are various points at which errors can  
arise in the present system.

Initially the meter reader may select an incorrect card, or the wrong part of the book, to enter the reading. Secondly the meter reader may actually mis-read the meter. It is often the case that meters are located in inaccessible places, such as in cupboards under stairs, and it is thus not unusual for the meter reader to make an error of this type. Furthermore, the entries on the cards or in the book may be in-correctly entered on to the computer by the computer keyboard operator.

The present invention seeks to provide an apparatus for use when reading meters, and a method of reading meters which reduces the disadvantages of the present methods.

According to this invention there is provided an arrangement comprising a meter and a device to be utilised in reading the meter, the meter to be read comprising means adapted to provide information identifying the meter, and means providing information indicative of the meter reading, said device comprising a memory, means to transfer to the memory, from the meter, information identifying the meter and means to transfer to the memory, from the meter, information relating to the meter reading, the memory being provided with means to enable information stored in the memory to be transferred directly to a computer or the like.

Preferably the meter comprises an electricity, gas, or water meter.

Conveniently said device is a hand-held portable device.

Advantageously the meter is provided with optically readable means comprising said means to

provide information identifying the meter, and the said device is provided with means adapted to read optically said optically readable means to transfer, to the memory, said information identifying the meter.

5

Preferably the said optically readable means comprise a bar code, and the means to transfer information to the memory comprise a bar code reader.

10

Conveniently the means to transfer information relating to the meter reading to the device comprise a manually operable keyboard.

15

Preferably the means to transfer, to the memory, the meter reading comprise means adapted to read a display present on the meter.

20

Preferably said means adapted to read the display on the meter comprise an optical character recognition arrangement.

25

In a preferred embodiment the meter is provided with a transmitter adapted to transmit information identifying the meter and indicating the meter reading, and said device is provided with a receiver adapted to receive the transmitted information, information received on the receiver being passed to the memory.

30

Conveniently the device is provided with a transmitter, and the meter is provided with a receiver, the transmitter on the device being operable to transmit a signal to the receiver on the meter to initiate operation of the transmitter on the meter.

35

Preferably the device is provided with manually operable means to institute operation of the transmitter present on the device.

One or both transmitters comprising an optical transmitter, such as an optical transmitter which operates in the infra-red region of the spectrum, or a radio-frequency transmitter, or an ultrasonic transmitter, or an inductive or magnetic transmitter.

In a preferred embodiment said meter is an electricity meter and at least the transmitter on the meter is associated with a line modem to inject transmitted signals on to a line supplied with electricity through the meter, the said device being associated with a further modem connected to the receiver of the device, the device being provided with means to connect the device to the electrical circuitry supplied with electricity through said meter.

Preferably said device is provided with a conventional plug adapted to be received in a conventional socket which is supplied with electricity through said meter.

Conveniently the meter is provided with a transmitter and a receiver, each connected to said modem, and the said device is also provided with a transmitter and receiver, connected to the corresponding modem.

Alternatively the device is provided with means to connect it electrically directly to the meter so that direct contact is established between the transmitter in the meter and the receiver in the device.

Conveniently the device contains a battery adapted to supply power to the transmitter in the meter.

The arrangement may further incorporate a keyboard to enable further information to be entered into



the memory.

Preferably the means to enable information stored in the memory to be transferred directly to a computer or the like comprise a plug or socket connected to the memory, and connectable to said computer or the like.

The invention also relates to a meter for an arrangement as described and to a device to be utilised in reading a meter for an arrangement as described.

The invention also relates to a method of reading a meter, comprising the steps of utilising a device comprising a memory, transferring to the memory, from the meter, information identifying the meter, and transferring to the memory information relating to the meter reading, and subsequently transferring information stored in the memory directly to a computer or the like.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which

FIGURE 1 is a block diagram illustrating a meter, and associated apparatus, and a device for use in reading the meter,

FIGURE 2 is a view, corresponding to Figure 1, illustrating a modified embodiment of the invention and

FIGURE 3 is a further block diagrammatic view illustrating a meter and a further device for use in reading the meter.

Referring initially to Figure 1 of the drawing a meter 1 is illustrated which may be an electricity meter, a gas meter or a water meter, or indeed any other meter that needs to be read. Associated with the meter  
5 is a transmitting device 2, which is associated with a receiving device 3 and a memory 4.

A separate device 5, is illustrated, which is hand-held and portable. The device 5 includes an appropriate transmitter 6 adapted to transmit signals to the  
10 receiver 3, and a receiver 7 adapted to receive signals from the transmitter 2. The receiver 7 is associated with a memory device 8 which in turn is associated with an indicator 9 which may be an audible or visual indi-  
15 cator, and a conventional key-pad 10. The memory 8 is also associated with an outlet port 11.

The transmitter 2 may comprise an optical transmitter, adapted to transmit pulse code signals, which may preferably be in the infra-red part of the  
20 spectrum, or may be a radio frequency transmitter, or may be a transmitter of ultrasonic pulses. Alternatively the transmitter 2 may comprise an electro-magnetic coil located adjacent the surface of the meter which  
25 effectively transmits a magnetic field to the exterior of the meter. It will be appreciated that the receiver 7 will be adapted to detect and respond to signals transmitted by the transmitter 2. Similarly the transmitter 6, and the associated receiver 3, may again  
30 be an optical, radio frequency, ultrasonic or magnetic transmitter.

Whilst, in any one embodiment of the invention, the transmitter 2 and the transmitter 6 may both be of  
35 the same type, it is to be understood that the transmitter 2 and the transmitter 6 may be of different types within the same embodiment of the invention.

In use of the described arrangement the memory 4 will contain information serving to identify the meter 1. The transmitter 2 will be adapted to transmit a signal having a predetermined format, when activated, that signal comprising a part representative of the information present in the memory 4, and part representative of the reading of the meter 1. It is to be appreciated, of course, that the meter 1 may be a totally electronic meter, and may not have any numerals displayed on the face thereof. The transmitter 2 is activated when an appropriate control signal is received by the receiver 3.

The transmitter 6 is adapted to transmit the control signal which is received by the receiver 3 to activate the transmitter 2. A manually operable control is provided to activate the transmitter 6.

The receiver 7 is adapted to receive and decode the signal generated by the transmitter 2, and to pass appropriate signals to the memory 8. The signals are then recorded in the memory. When this cycle of operation has been completed the indicator 9 is activated, to confirm that the cycle of operation has been completed. The keyboard 10 is provided to enable further information to be entered into the memory 8, if necessary.

When a meter reader is to read the meter 1, the meter reader will take the hand-held apparatus 5 to the vicinity of the meter. If either the transmitter 2 or the transmitter 6 is a magnetic transmitter of the type described above, the meter reader must place the hand-held device 5 very close to the meter 1, but otherwise it is only necessary for the meter reader to hold the device 5 in the vicinity of the meter 1. The meter reader then operates the manually operable control which

activates the transmitter 6. The transmitter 6 transmits a control signal which is received by the receiver 3. The receiver 3 activates the transmitter 2 which transmits an information signal carrying information identifying the meter 1, and indicating the meter reading. This signal is received by the receiver 7 and is de-coded, and the two relevant items of information are stored in the memory 8. When this cycle is complete the indicator 9 is activated, so that the meter reader knows that the meter reading has been stored in the memory 8.

It is possible, of course, that this cycle may be repeated a number of times during the reading of any one meter, the signals obtained in the successive cycles of operation being compared before being entered into the memory, as a check of their accuracy.

The meter reader would, of course, read a considerable number of meters during the course of a working day, and all the relevant information would be stored in the memory 8. At the end of the day, the meter reader would take the hand-held device 5 to an appropriate location, and would connect the outlet port 11 associated with the memory 8 with an input of a computer. All the information present in the memory 8 would then be immediately down-loaded on to the computer, where the information could be readily processed to generate appropriate bills.

It will be understood that in utilising the described embodiment of the invention, there is no possibility of human error arising in the reading of the meter or in the transferring of the meter reading to the computer responsible for generating bills. It will also be appreciated that the meter reader may, particularly if an optical, radio frequency or ultrasonic transmitter

is utilised for the transmitters 2 and 6, read the meter without gaining immediate access to the meter. Thus, if the meter to be read is at the back of a cupboard under a set of stairs, and that cupboard is full of miscellaneous household articles, nevertheless the meter reader will be able to take a meter reading simply by opening the cupboard door, directing the hand-held device 5 into the cupboard under the stairs, and activating the manual control which initiates operation of the transmitter 6. Thus, not only will each meter be read accurately, but also each meter may be read very swiftly.

Figure 2 illustrates a modified embodiment of the invention, which has a large number of parts identical to the parts illustrated in Figure 1, and these parts carry the same reference numerals. However, in the embodiment illustrated in Figure 2 the meter 1 is an electricity meter. The electricity meter is connected to a mains supply 12 as it enters the appropriate premises. The main supply 12 is provided with a suppressor 13, such as ferrite elements surrounding the mains supply, adjacent the meter 1. The main supply passes through the meter, leaving the meter through a line 14 which is provided with a line modem 15 which is connected to the transmitter 2 and to the receiver 3.

The hand-held device 5 is provided with a modem 16 which is connected to the transmitter 6 and the receiver 7. The modem 16 is provided with a lead 17 terminating in a conventional plug 18 which can be introduced to a conventional socket 19 supplied with electricity from the meter 1 through the ring main or other circuitry present in the building in which the meter 1 is installed.

In this embodiment the transmitter 2 and 6 and the receivers 3 and 7 are really transmitting and re-

ceiving circuits adapted to pass signals through the modems 15 and 16.

5           It will be readily appreciated that in use of  
the embodiment illustrated in Figure 2 the meter reader  
would gain access to the premises in which the meter 1  
is installed and would then merely insert the plug 18  
10 into any convenient electrical socket 19 connected to  
the meter. The manually operable control would then be  
initiated to initiate the transmitter 6 which would then  
transmit an appropriate control signal through the  
15 modem 16, through the lead 17 and the plug 18 into the  
socket 19, and through the ring main or other circuitry  
to the modem 15, from whence the signal would pass to  
the receiver 3. On receipt of the signal the receiver 3  
would activate the transmitter 2 which would transmit a  
20 signal carrying information from the memory 4 identify-  
ing the meter and also carrying information represent-  
ative of the meter reading. The signal from the trans-  
mitter 2 passes through the modem 15 into the ring main  
or the like, to the socket 19, through the plug 18 and  
lead 17 to the modem 16, the signal then passing to the  
25 receiver 7. As in the embodiment described above infor-  
mation is then stored in the memory 8 representative of  
the identity of the meter 1 and the meter reading for  
subsequent down-loading through the outlet port 11.

30           It will be appreciated that in utilising this  
embodiment of the invention it is not even necessary to  
gain access to the meter, but instead the meter reader  
merely has to locate a convenient electrical socket.  
The suppressor 13 is provided to prevent signals from  
either the modem 16 or the modem 15 passing back down  
35 the mains supply 12.

The embodiment illustrated in Figure 2 may be  
modified to be plugged directly into a socket in the

meter. In the case of an electricity meter this obviates the need for the modems. However, in an arrangement of this type the battery in the hand-held device may then supply power to the circuitry in the meter.  
5 Consequently an arrangement of this type may be used on gas or water meters, for example, without the need for a battery or electrical supply in the meter itself.

In the embodiments described with reference to  
10 Figures 1 and 2 the hand-held device 5 incorporates a keyboard 10. The keyboard 10 may have to be utilised if, for any reason, the automatic transfer of information cannot be accomplished. It is to be understood that if the meter 1 is a gas meter or a water meter, the  
15 transmitter 2 and receiver 3 and the associated memory 4 will either have to be battery powered or have to be connected to a mains electricity supply. In either case, it is possible that, at the time that the meter is read, the electrical supply is not functioning. The  
20 battery may have run out, or the main electrical supply may have been disconnected, for example if the meter is present in a house that has just been sold and where the occupants are re-locating. Thus the keyboard may be utilised in such circumstances where the automatic  
25 transfer of information from the meter to the memory in the hand-held device is not practicable.

Figure 3 illustrates a further embodiment of the invention. In this embodiment of the invention a  
30 meter 21 is provided with a portion 22 displaying the meter reading, and is also provided with further indicia 23, exemplified as a bar code, to identify the particular meter. Thus the meter 21 may be a conventional meter with a strip carrying a bar code adhered to  
35 it.

Figure 3 illustrates a hand-held device 24

which comprises a bar code reader 25 and an optical character reader and recogniser 26. The outputs of the reader 25 and 26 are connected to a memory 27 which is associated with an indicator 28, a keyboard 29 and an outlet port 30.

It will be appreciated that the bar code reader 25 is adapted to read the bar code 23 and the optical character reader and recogniser 26 is adapted to read directly the digital meter reading 22.

A manually operable control will be provided to activate the readers 25 and 26, and the meter reader will then wipe the appropriate part of the hand-held device 24 across the bar code 23, and will then hold the optical character reader 26 in alignment with the region 22 of the meter displaying the meter reading. It is envisaged that in certain embodiments of the invention the optical character reader will not be provided, but instead the meter reader will merely wipe the bar code with the bar code reader and will then enter the meter reading through the keyboard 29.

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CLAIMS:

- 5 1. An arrangement comprising a meter and a device  
to be utilised in reading the meter, the meter to be  
read comprising means adapted to provide information  
identifying the meter, and means providing information  
indicative of the meter reading, said device comprising  
10 a memory, means to transfer to the memory, from the  
meter, information identifying the meter and means to  
transfer to the memory, from the meter, information re-  
lating to the meter reading, the memory being provided  
with means to enable information stored in the memory to  
15 be transferred directly to a computer or the like.
2. An arrangement according to Claim 1 wherein  
the meter comprises an electricity, gas, or water meter.
- 20 3. An arrangement according to Claim 1 or 2 where-  
in said device is a hand-held portable device.
4. An arrangement according to any one of the pre-  
ceding Claims wherein the meter is provided with opti-  
25 cally readable means comprising said means to provide  
information identifying the meter, and the said device  
is provided with means adapted to read optically said  
optically readable means to transfer, to the memory,  
said information identifying the meter.
- 30 5. An arrangement according to Claim 4 wherein  
the said optically readable means comprise a bar code,  
and the means to transfer information to the memory com-  
prise a bar code reader.
- 35 6. An arrangement according to Claim 4 or 5 where-  
in the means to transfer information relating to the

meter reading to the device comprise a manually operable keyboard.

5           7.           An arrangement according to Claim 4 or 5 wherein the means to transfer, to the memory, the meter reading comprise means adapted to read a display present on the meter.

10           8.           An arrangement according to Claim 4 and 5 wherein said means adapted to read the display on the meter comprise an optical character recognition arrangement.

15           9.           An arrangement according to any one of Claims 1 to 3 wherein the meter is provided with a transmitter adapted to transmit information identifying the meter and indicating the meter reading, and said device is provided with a receiver adapted to receive the transmitted information, information received on the receiver being passed to the memory.

25           10.          An arrangement according to Claim 9 wherein the device is provided with a transmitter, and the meter is provided with a receiver, the transmitter on the device being operable to transmit a signal to the receiver on the meter to initiate operation of the transmitter on the meter.

30           11.          An arrangement according to Claim 10 wherein the device is provided with manually operable means to institute operation of the transmitter present on the device.

35           12.          An arrangement according to any one of Claims 9 to 11 wherein one or both transmitters comprise an optical transmitter.

13. An arrangement according to Claim 12 wherein the or each optical transmitter operates in the infra-red region of the spectrum.

5 14. An arrangement according to any one of Claims 9 to 11 wherein one or both transmitters comprise a radio-frequency transmitter.

10 15. An arrangement according to any one of Claims 9 to 11 wherein one or both transmitters comprise an ultrasonic transmitter.

15 16. An arrangement according to any one of Claims 9 to 11 wherein one or both transmitters comprises an inductive or magnetic transmitter.

20 17. An arrangement according to any one of Claims 9 to 11 wherein said meter is an electricity meter and at least the transmitter on the meter is associated with a line modem to inject transmitted signals on to a line supplied with electricity through the meter, the said device being associated with a further modem connected to the receiver of the device, the device being provided with means to connect the device to the electrical circuitry supplied with electricity through said meter.

30 18. An arrangement according to Claim 17 wherein said device is provided with a conventional plug adapted to be received in a conventional socket which is supplied with electricity through said meter.

35 19. An arrangement according to Claim 17 or 18 wherein the meter is provided with a transmitter and a receiver, each connected to said modem, and the said device is also provided with a transmitter and receiver, connected to the corresponding modem.

20. An arrangement according to any one of Claims 9 to 11 wherein the device is provided with means to connect it electrically directly to the meter so that direct contact is established between the transmitter in the meter and the receiver in the device.

21. An arrangement according to Claim 20 wherein the device contains a battery adapted to supply power to the transmitter in the meter.

22. An arrangement according to any one of Claims 9 to 21 further incorporating a keyboard to enable further information to be entered into the memory.

23. An arrangement according to any one of the preceding Claims wherein the means to enable information stored in the memory to be transferred directly to a computer or the like comprise a plug or socket connected to the memory, and connectable to said computer or the like.

24. A meter for an arrangement according to any one of the preceding Claims.

25. A device to be utilised in reading a meter for an arrangement according to any one of the preceding Claims.

26. A method of reading a meter, comprising the steps of utilising a device comprising a memory, transferring to the memory, from the meter, information identifying the meter, and transferring to the memory information relating to the meter reading, and subsequently transferring information stored in the memory directly to a computer or the like.

27. An arrangement substantially as herein des-

cribed with reference to and as shown in Figure 1 of the accompanying drawings.

5 28. An arrangement substantially as herein described with reference to and as shown in Figure 2 of the accompanying drawings.

10 29. An arrangement substantially as herein described with reference to and as shown in Figure 3 of the accompanying drawings.

30. Any novel feature or combination of features disclosed herein.

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